is varied for the intended control. When the layer 4 is of an alloy film of Au-Cu, the alloying compositional ratio of Au to Cu is varied for the intended control.

Concretely, it is desirable that the composition of the Au-Cu alloy for the layer 4 falls within a range of $Au_{25}Cu_{75}$ to $Au_{75}Cu_{25}$ (at.%). Where the layer 4 is of a laminate film of alloy layers and metal films, it is desirable that it has an Au-richer composition in some degree, as compared with the layer 4 of a single-layered Au-Cu alloy film. For example, the laminate film of the layer 4 may have a composition of $Au_{25}Cu_{75}$ to $Au_{95}Cu_5$ (at.%).

In the spin valve films 8 of Fig. 32, Fig. 33 and Fig. 34, the free layer 1 is positioned in the lower site. However, these are not imitative. The invention encompasses bottom type spin valve films 8 or dual element-type spin valve films 8 in which the free layer 1 is positioned in the upper site, for example, as in Fig. 41 and Fig. 42. In particular, in those bottom type spin valve films and dual spin valve films, the effect of the MR-improving layer as the subbing film for the antiferromagnetic layer is significant.

The spin valve films 8 of Fig. 41 and Fig. 42 has a structure of nonmagnetic underlayer 5/MR-improving layer 4/antiferromagnetic layer 6/pinned magnetic layer 2/nonmagnetic spacer layer 3/free layer 1/MR-improving layer 4/protective layer 7 as laminated in that order on the substrate

9. In the embodiment of Fig. 41, the MR-improving layer is of an alloy layer 4c. In the embodiment of Fig. 42, the MR-improving layer 4 is of a laminate film of a plurality of metal films 4a and 4b. As in Fig. 34, a laminate film of a metal film 4a and an alloy layer 4c is also employable for the layer 4 in those embodiments.

Where the MR-improving layer 4 as disposed above the free layer 1 is of a laminate film, as in Fig. 42, it is desirable that the first metal layer 4a of Cu or the like is disposed adjacent to the protective layer 7, like in the upper MR-improving layer 4 in Fig. 39. Therefore, in Fig. 42, the MR-improving layer 4 above the free layer 1 is of a laminate film of first metal film 4a/second metal film 4b/first metal film 4a.

In the bottom type spin valve films, the MR-improving layer which is the underlayer for the antiferromagnetic layer acts for film growth control, thereby improving the thermal stability and the pinning characteristics of the films through lattice spacing control and microstructure control, and those effects of the MR-improving layer differ from the effects of the free layer for magnetostriction control and for specular reflection improvement. Therefore, so far as they are produced under the condition under which the microstructure of the antiferromagnetic layer therein is kept good, the bottom type spin valve films of the invention could fully exhibit their

good capabilities only with the MR-improving layer being disposed adjacent to the free layer even in the absence of the MR-improving layer below the antiferromagnetic film or even when the antiferromagnetic layer is disposed above an ordinary buffer layer of Ta, Ti or the like as in the ordinary subbing constitution in conventional reverse structures.

In the bottom type spin valve films 8, where the MR-improving layer 4 as above is disposed adjacent to the free layer 1, the compositional steepness in the interface between the free layer 1 and the MR-improving layer 4 is kept to give specular reflection thereon, whereby the MR characteristics of the films could be ensured. When the free layer thickness is thin and the compositional steepness in the interface between the free layer and the MR-improving layer 4 is kept to give the spin-filter effect, whereby the MR characteristics of the films could be ensured. In those, as so mentioned hereinabove, the MR ratio supported by the specular reflection or by the spin-filter effect is still kept even after annealing, and the films could have good thermal stability.

In the reverse structure-type spin valve films 8 mentioned above, at the interface of free layer 1/MR-improving layer 4, and even at the interface of first metal film 4a/second metal film 4b at the interface of second metal film 4b/third metal film 4a in the MR-improving layer 4 (Fig. 42) reflect electrons. Therefore, the constitution of the films 8 differs